

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
16 October 2003 (16.10.2003)

PCT

(10) International Publication Number
WO 03/084338 A1

(51) International Patent Classification⁷: **A23G 3/30**,
A61K 9/00

(21) International Application Number: PCT/EP03/03598

(22) International Filing Date: 4 April 2003 (04.04.2003)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
02425209.0 5 April 2002 (05.04.2002) EP

(71) Applicant (*for all designated States except US*): **GUM
BASE CO. SPA** [IT/IT]; Via Nerviano 25, I-20020 Lainate
(IT).

(72) Inventors; and

(75) Inventors/Applicants (*for US only*): **SOZZI, Giuseppe**
[IT/IT]; Via Re Umberto, 45, I-20020 Lainate (IT). **AL-
LASIA, Fabio** [IT/IT]; Via Dostoevskij, 5/F, I-20098 San
Giuliano Milanese (IT).

(74) Agents: **PISTOLESI, Roberto** et al.; Dragotti & Asso-
ciati Srl, Galleria San Babila, 4/C, I-20122 Milano (IT).

(81) Designated States (*national*): AE, AG, AL, AM, AT, AU,
AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU,
CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH,
GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC,
LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW,
MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SC, SD, SE,
SG, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ,
VC, VN, YU, ZA, ZM, ZW.

(84) Designated States (*regional*): ARIPO patent (GH, GM,
KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW),
Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM),
European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE,
ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO,
SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM,
GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Declaration under Rule 4.17:

— *of inventorship (Rule 4.17(iv)) for US only*

Published:

— *with international search report*

*For two-letter codes and other abbreviations, refer to the "Guid-
ance Notes on Codes and Abbreviations" appearing at the begin-
ning of each regular issue of the PCT Gazette.*

(54) Title: CHEWING GUM IN POWDER FORM AND A METHOD OF PREPARATION

(57) Abstract: The subject of the invention is a novel chewing gum in tablet form which can be produced by direct compression of a gum formulation in powder form; the chewing gum thus obtained is characterized by a pleasant chewability which remains unchanged throughout the chewing period without hardening like most conventional chewing gums. The chewing gum in powder form is produced by a method which comprises the following steps: a) mixing of a soft basic gum, i.e. gum base, with at least one sweetener and, optionally, at least one other typical chewing-gum ingredient, at a temperature of between about 35 and 75 °C; b) cooling of the mixture thus obtained to a temperature of between about 0 and -40 °C and preferably between -10 and -40 °C; c) grinding and subsequent screening of the mixture thus obtained to a particle size of less than about 10 mesh; d) optional mixing of the powder thus obtained with at least one anti-agglutination agent; e) optional compression of the mixture thus obtained.



WO 03/084338 A1

CHEWING GUM IN POWDER FORM AND A METHOD OF PREPARATION**INTRODUCTION**

The subject of the present invention is a novel chewing gum in tablet form, which can be produced by direct compression of a gum formulation in powder form; the chewing gum thus obtained is characterized by a pleasant chewability which remains unchanged throughout the chewing period without hardening like most conventional chewing gums.

BACKGROUND OF THE INVENTION

Examples of chewing gums in compressed form produced by direct compression of mixtures in powder form have been known in the art for several years and various types are available commercially. However, the compressed-powder gums which are currently available are unpleasant to chew because to avoid technical difficulties in the production process they have been produced from hardbasic gums. It is in fact known that it is much easier to grind and compress hard and dry materials and that the compression of powders is more complex the softer they are; up to now, the need to have starting mixtures or materials which are sufficiently hard or dry to be granulated and compressed easily has led to the production of chewing gums which are hard and friable, with the risk of some of the gum accidentally being swallowed.

Various chewing gums produced by the compression of powdered ingredients are described in the literature. As early as 1942, United States patent US-2,290,120 described, for example, the preparation of chewing gums by cold grinding of basic gum and glucose syrup (at about -20°C) and subsequent mixing and compression thereof; however, the basic gums used in this patent contain natural gums which, owing to their known

limitations with regard to performance, quality of supply, and technical problems of use, have now been almost completely abandoned and replaced by other, synthetic ingredients.

United States patent US-4,753,805 describes the granulation and subsequent compression of a chewing-gum composition having a moisture percentage of between 2 and 8%, with the use of various technological coadjuvants such as anti-agglutination agents and granulation coadjuvants (alkali-metal phosphates, alkaline-earth metal phosphates, maltodextrins, or mixtures thereof).

European patent EP-0221850 describes chewing-gum formulations which are suitable for being formed into tablets and which are produced by mixing the basic gum with dry ingredients, including the aromatic portion, without the plasticization due to the oils of the flavourings, subsequent cooling of the mixture to above the freezing point of water (5-10°C), dry granulation, and compression.

United States patent US-4,000,321 describes a chewing gum with characteristics of softness during chewing and light weight. This result is achieved by cold granulation of a chewing-gum mixture, followed by spontaneous adhesion by heating of the granulate. A chewing gum which contains bubbles and which cannot be mixed with other ingredients is thus obtained.

WO 99/2503 describes a process which provides for the preparation of a chewing-gum mass in powder form in which the basic gum is cooled to a temperature of between 0 and -35°C; the mass thus cooled is then granulated, supplemented with the necessary additives and active ingredients, and then compressed.

United States patent US-4,588,592 describes a method of preparing chewing gums containing from 70 to 95% by weight of granulated sugar. The granulated sugar, previously heated to a temperature of between 51 and 93°C, is mixed with the basic gum at a temperature of between 54 and 121°C. The product thus obtained can then be used as it is or transformed into a granular product, after cooling to a temperature of between -6 and -40°C.

US-4,161,544 describes a method of preparing chewing gum which provides for sugars to be mixed with a basic gum, heated to a temperature of 60-120°C; the temperature is then reduced to between 30 and -5°C and the mass thus obtained is granulated. The method in question provides for the use of "bulking agents" such as gum arabic, pectin, or other similar additives; as is well known, these ingredients are soluble in water and, as such, will be ingested after brief chewing, together with the sugars, thus leaving a bolus of harder consistency; the object proposed is thus achieved only partially, providing chewing which is extremely variable over time.

Finally, International patent application WO 01/19206 describes a particularly laborious method of preparing chewing gum, requiring a pretreatment of the basic gum mixture which is reduced to pellets of relatively small particles which in turn are then cooled to extremely low temperatures, i.e. below -40°C, by the addition of dry ice. Even when operation takes place in special, greatly dehumidified environments (with consequent greater economic expense and reduced practicality), this selection easily leads to the formation and accumulation of condensation on the dry ice intimately

mixed with the gum composition, with the formation of lumps and agglutinations.

As mentioned above, however, the methods described in the above-mentioned patent documents have considerable drawbacks such as, for example, the production of chewing gum with poor chewability.

DESCRIPTION OF THE INVENTION

A method has now been discovered which permits the production of a chewing gum in powder form which is transformed, simply by compression, into a gum tablet with chewability and softness characteristics similar to or better than those of good-quality, conventionally-produced chewing gums, particularly with regard to optimal palatability throughout the chewing period.

A further advantage of the present invention is the ability to produce pharmaceutical or medicated chewing gums containing one or more active ingredients which are sensitive to heat; in fact, in contrast with conventional techniques, the mixing of the gum in powder form with the active ingredients and its subsequent transformation into the finished product does not require heating.

Another advantage offered by the process of the present invention is that it allows to produce a chewing gum in various forms and shapes other than the conventional ones, including tablets and micropellets of less than 0.8 grams (which would be very hard to produce with traditional means) simply by replacing the punches in a press.

A method for manufacturing miniature chewing gums is disclosed in WO 02/094032, filed by Wrigley, and it is substantially based in the extrusion of the chewing gum in the liquid filled chamber of a so-called "underwater

pellettizer", as for instance that manufactured by Gala Industries and disclosed in WO 01/2137.

The method according to WO 02/094032 presents however a drawback which cannot be neglected: due to the technical characteristics of the underwater pellettizer, the amount of bulk sweetener in the chewing gum must be kept quite low; consequently, in case a sweet chewing gum is desired, the gum center extruded by the underwater pellettizer has to be surrounded by a coating which comprises at least 50% by weight of the coated chewing gum and which contains the necessary amount of bulk sweetener, as for instance disclosed in WO 02/094032, also filed by Wrigley.

On the contrary, the method according to the present invention permits to manufacture micropellet chewing gums independently of the amount of bulk sweetener requested.

Another advantage which will become clear from the following description is that the chewing-gum formulation in powder form can be packaged, dispatched, and preserved, even for prolonged periods of time, without losing its properties, in fact remaining completely in the granulated state.

Finally, another advantage offered by the present invention is that it is possible to produce a chewing gum in various forms other than the conventional forms and shapes, simply by replacing the punches in a tablet press.

In contrast with the prior art described in the literature, in order to prepare the powdered chewing-gum mixture, it is not necessary to use exclusively dry ingredients or to mix frozen ingredients in powder form without liquid ingredients or other forms of plasticization such as, for example, liquid

flavourings, to avoid softening the mixture. In fact, one of the main characteristics of the present invention is the fact that it is possible to operate initially in accordance with the usual preparation method which is used for the preparation of conventional chewing gums (that is, those which are not in powder form).

Moreover, the method according to the present invention can be implemented without the aid of granulation coadjuvants such as, for example, alkali-metal phosphates, alkaline-earth metal phosphates, maltodextrins, or mixtures thereof, and/or without the aid of "bulking agents" such as, for example, gum arabic or pectin.

Another advantage of the following preparation method consists in the complete use and recovery of the product which thus permits an absence of processing losses or waste.

One of the elements which characterize the present invention is the use of "soft" basic gums which give rise to products having a pleasant chewing profile, comparable with, if not better than, that of conventional products. It has in fact been discovered that, in contrast with the prior art, it is possible to produce complete chewing-gum mixtures in powder form, ready to be compressed and thus also comprising the flavouring portion in the desired percentage, with the use of soft starting basic gums.

The method for the production of chewing gum in powder form according to the present invention is characterized in that it comprises the following steps:
a) mixing of a soft basic gum, i.e. a gum base, with at least one sweetener and, optionally, at least one other

typical chewing-gum ingredient, at a temperature of between about 35 and 75°C,

b) cooling of the mixture thus obtained to a temperature of between about 0 and -40°C and, preferably, between -10 and -40°C,

c) grinding and subsequent screening of the mixture thus obtained to a particle size of less than about 10 mesh,

d) optional mixing of the powder thus obtained with at least one anti-agglutination agent,

e) optional compression of the mixture thus obtained.

The mixing (step a) is preferably performed at a temperature of between about 40 and 50°C for a period of about 10-30 minutes, preferably 20 minutes.

The grinding (step c) is preferably performed until particles having a size of less than about 10 mesh and preferably less than 14 mesh are obtained.

Within the scope of the present invention, "soft basic gum" is intended to define a basic gum characterized by a penetration index, in 1/10 mm, which is greater than about 15 and, preferably, greater than 18 (measured in accordance with the "Standard method for Needle Penetration of Petroleum Waxes", ASTM D1321-97).

In particular, the soft basic gum preferably used for the implementation of the present invention will have the following qualitative/quantitative composition:

- from about 8 to 16% of one of more elastomers, preferably selected from the group comprising polyisobutylene, isobutylene/isoprene copolymer, and vinyl acetate/vinyl laurate copolymer,
- from about 12 to 19% of polyvinyl acetate,
- from about 14 to 30% of resin preferably to be selected from the group comprising vegetable resin

esters, resins produced by synthesis, and/or terpene resins,

- from about 10 to 22% of hydrogenated or partially hydrogenated vegetable oils,
- from about 0 to 7% of waxes selected from the group comprising vegetable waxes, waxes derived from petroleum, and/or synthetic waxes,
- from about 5 to 9% of emulsifiers and technological assistants, more precisely, but not exclusively, glycerol monostearate, acetylated monoglycerides, lecithin, sugar esters and triacetin,
- from about 15 to 40% of inert mineral fillers,
- up to about 0.1% of antioxidants.

The soft basic gum may be mixed in the usual manner with one or more polyols or with sugar, with or without the presence of polyol syrups or glucose syrup, with or without the presence of intensive sweeteners, and with or without the presence of liquid flavourings and other additives such as food acids, softeners, etc.

The selection of the specific ingredients does not alter the principle of the invention and is appropriate for the use of the product, particularly when the gum mixture in powder form is marketed as such and the purchaser intends to enrich it with further flavourings in powder form, intensive sweeteners, or dietary, functional, pharmaceutical, or cosmetic active ingredients, before forming tablets.

If the sweeteners and the other typical chewing-gum ingredients usable in step a) of the present invention are used in the solid state, they normally have a particle size of less than 200 μm and preferably less than 150 μm .

The term "typical chewing-gum ingredients" is intended to define intensive sweeteners, flavourings and other

additives. In particular, intensive sweeteners typically used are aspartame, acesulfame and salts and derivatives thereof, saccharine, neohesperidin dihydrochalcone, sucralose, neotame, thaumatococine, monelline etc. The term "flavourings" is intended to define any mixture of natural or synthetic aromatic oils or of individual active flavouring ingredients, taken individually or in combination, refreshing substances, etc., in solution or carried by a suitable vehicle by means of one or more of the known techniques.

The additives usable in the present invention are all of those commonly used in the production of conventional chewing gum and thus comprise colorants, food acids, softeners, flavourings, etc.

As is known in the art, the basic gum may be mixed with the use of preheated gum or gum at ambient temperature, according to its format, i.e., the use of 8-10 kg blocks of basic gum in fact requires preheating which is not necessary for formats which can be metered in pellets or drops. The basic gum is thus mixed with the ingredients selected as described above at a conventional temperature of between 35 and 75°C, most preferably between 40 and 55°C, for a period of time of between 10 and 30 minutes, with the use of one of the techniques known in the art. Upon completion of this mixing, the mixture is discharged and conditioned at a temperature of between -40 and 0°C. In particular, it is possible to operate discontinuously with prolonged cooling to temperatures between -30 and 0°C and, preferably between -15 and -25°C; alternatively, it is possible to use methods which ensure continuous cooling to temperatures of between -40 and -10°C.

The mixture is then ground by means of a blade mill. A percentage of the mass will be obtained with a satisfactory particle size straight away, whereas the portion with a particle-size greater than that desired is subsequently ground in a mill, optionally cooled to a temperature of between -40 and 0°C, and then recycled, thus achieving a 100% yield. Should it also be necessary to have a lower particle-size limit, the portion separated can be entirely reprocessed, thus also permitting complete recovery of the product in this case; the powder thus obtained preferably has a particle size greater than 100 mesh and, even more preferably, greater than 80 mesh.

Anti-agglutination agents such as, for example, metal salts of fatty acids, precipitated silica, sugar esters, polyols of the type most suitable for compression, for example, isomalt and xylitol, are added to the powder thus obtained.

Additionally one or more intensive sweeteners such as aspartame, acesulfame and salts and derivatives thereof, saccharine, neohesperidin dihydrochalcone, sucralose, neotame, thaumatococine, monelline etc., aromatic active ingredients or flavourings in powder form or carried by encapsulation etc., food acids, or other additives with specific functional and pharmaceutical or nutritional active ingredients such as vitamins, amino-acids, polypeptides or other substances with functional or cosmetic activity may also be added at this stage.

The chewing-gum mixture in powder form thus obtained has the advantage that it can be used directly or can be packaged, stored and dispatched to a purchaser who can thus simply proceed with tablet-forming, possibly preceding this operation with an additional mixing with

further flavourings in powder form, encapsulated flavourings etc., and/or dietary, functional, pharmaceutical or cosmetic active ingredients, as required. The pharmaceutical industry is in fact not normally equipped with the machinery used for processing chewing gums, and can give form and consistency to the finished product solely by compression of a powder. Up to now, these limitations have led to an underestimation of the potentialities of chewing gum as a release vehicle.

The final stage of the processing consists in forming into tablets or pills in a very wide selection of formats and dimensions by a tablet or a pill press or a tablet-forming machine; the tablets or pills thus obtained may therefore be packaged straight away in the desired format, i.e. in blister packs, sticks, etc. or sugar-coated, optionally also incorporating one or more flavourings, sweeteners and active ingredients in the coating, and then packaged.

A particular embodiment of the present invention is represented by chewing gums obtained by coating micropellets obtainable through the described process. Such coated micropellet chewing gums having a gum center surrounded by a coating and a total weight of less than 1.2 grams, preferably less than 0.8 grams, even more preferably less than 0.5 grams and/or a diameter lower than 10mm, preferably lower than 8mm.

The coating will essentially consist of bulk sweeteners and it may comprise up to about 55%, preferably up to 45% by weight of the coated chewing gum; more than about 80% by weight of the preferred coating will normally consist of bulk sweeteners, more preferably from 85 to 95%.

The micropellets used as gum centers will normally contain from about 60 to 90% by weight of basic gum and from about 5 to 25% by weight of bulk sweeteners, preferably from 10 to 20% of bulk sweeteners, together with customary ingredients (such as intensive sweeteners, flavourings, anti agglutination agents and vegetable extracts). A preferred embodiment of the gum center which can be used for manufacturing the micropellet chewing gums according to the invention is disclosed in example 10 (and table 3).

Further aspects of the invention will become clear from the following experimental and comparative sections which should not, however, be considered as limiting of the invention.

EXPERIMENTAL SECTION

Example 1

The following description refers to the preparation of a gum in powder form having the qualitative composition given in Example 1 in Table 1.

Initially, 29.3 parts by weight, which was the entire quantity of basic gum, was mixed, in a sigma mixer, heated to a temperature of between 40 and 50°C, with 13.47 parts of sorbitol in powder form, which was one third of the sorbitol quantity, and with 6.7 parts of mannitol. After a few minutes, a second portion of sorbitol in powder form, again of one third of the total was added, together with 0.4 parts of intensive sweeteners, mixing was continued for a few minutes, and the remaining sorbitol was then added, together with 2.2 parts selected from flavourings in liquid and powder form, homogenization of the mixture being continued for a further few minutes.

It is useful to point out that the quantity of flavouring which is in powder form could also be added after grinding.

10-30 minutes after the start of the mixing, the mixture thus obtained was discharged and left to condition at a temperature of about -20°C.

After a period of about 24 hours, the chewing-gum mixture thus treated was ground in a blade mill with a 4 mm² grating and the ground material was screened.

After screening, a mixture which had a particle size of less than 10 mesh and 60% of which had a particle size of less than 14 mesh was obtained.

3.5 parts of anti-agglutination mixture and 17.5 parts of isomalt of the type commonly marketed for applications in the tablet-forming field were added to 79 parts of the chewing-gum mixture in powder form thus obtained. The chewing-gum mixture in powder form was then compressed.

The method described above may also be applied to the preparation of gums in powder form having a composition other than that of Example 1, such as the compositions of Examples 2-8 of Tables 1 and 2.

Example 6

The following description refers to the preparation of a gum in powder form having the qualitative composition given in Example 6 in Table 2. In the first step, 27 parts of soft basic gum, 36.8 parts of sorbitol, 5.3 parts of mannitol, 8.8 parts of isomalt, 2.3 parts of sorbitol syrup, 0.3 parts of intensive sweetener, 0.3 parts of liquid flavouring, and 0.2 parts of additive were mixed by methods similar to those described in the preceding example. In this example, the term "additives" means a plasticizer selected from those

commonly used in chewing gum, in view of the low percentage of liquid flavouring used.

The mixture was discharged, conditioned, ground and, in the final step, 3 parts of anti-agglutination mixture and 16 parts of vegetable extracts were added to 81 parts of the mixture in powder form thus obtained. The chewing-gum mixture thus obtained could then be compressed.

Example 8

The following description refers to the preparation of a gum in powder form having the qualitative composition given in Example 8 in Table 2. A method similar to that of the preceding example was used but, in this example, the quota of isomalt, which was equal to 21.5 parts, was composed of 6.5 parts of conventional isomalt for chewing gum, which was added in the first mixing step, and by 15 parts of isomalt of a type suitable for compression, which was added to the mixture in powder form, in the second step.

Example 10

The following description refers to the preparation of a gum in powder form having a quantitative composition given in Example 10 in (Table 3). A method similar to that of previous examples was used. Chewing gums obtained under this example are particularly suited to be coated in order to obtain products with a weight lower than 1.2 grams, preferably lower than 0.8 grams, even more preferably less than 0.5 grams. It is worth of note that the softness characteristics of the basic gum are such that the chewing gum tablets thus obtain have pleasant chewing properties substantially identical to that of conventional chewing gums also when using high percentages of gum base.

The preferred coating for surrounding the compressed chewing gum obtained according to the present example will have the following by weight composition:

- Intensive sweetener 1.4 %
- Flavour 3.5 %
- Colour (preferably TiO_2) 1.6 %
- Bulk sweetener (preferably maltitol) 87.5 %
- Other additives (preferably arabic gum) 6.0 %

Total 100.0 %

Table 1

	Example No. 1	Example No. 2	Example No. 3	Example No. 4	Example No. 5
Basic gum	29,3	48,5	48,0	29,5	30,8
Sorbitol	40,4	47,5	46,5	39,7	50,3
Mannitol	6,7			6,9	4,4
Isomalt	17,5			17,0	7,0
Citric acid				0,6	
Additive				0,5	0,6
Intensive sweetener	0,4			0,3	0,3
Liquid flavouring	0,6			1,0	1,6
Flavouring in powder form	1,6			2,0	
Plasticizer			1,5		
Anti-agglutination mix	3,5	4,0	4,0	2,5	5,0
Total	100,0	100,0	100,0	100,0	100,0

Table 2

	Example No. 6	Example No. 7	Example No. 8		Example No. 9
Basic gum	27,0	32,1	25,3	Basic gum	20,2
Sorbitol	36,8	37,8	32,2	Glucose syrup	2,9
Mannitol	5,3	5,8	5,6	Sucrose	71,2
Isomalt	8,8	4,1	21,5		--
Sorbitol syrup	2,3	2,5	2,1		--
Citric acid			0,7		--
Additives	0,2	0,1	0,1	Additives	1,0
Intensive sweetener	0,3	0,3	0,3		--
Liquid flavouring	0,3	1,3	0,4	Liquid flavouring	0,7
Flavouring in powder form		2,0	0,7	Flavouring in powder form	--
Anti- agglutination mix	3,0	3,0	8,4	Anti- agglutination mix	4,0
Vegetable extracts	16,0	11,0	2,7	Active ingredient	--
Total	100,0	100,0	100,0	Total	100,0

Table 3

	Example No. 10
Basic Gum	70.0
Sorbitol	--
Mannitol	--
Isomalt	18.0
Sorbitol syrup	--
Citric acid	--
Additives	--
Intensive sweetener	0.2
Liquid flavouring	0.4
Flavouring in powder form	6.4
Anti agglutination mix	5.0
Vegetable extracts	--
Total	100.0

According to requirements, it is thus possible to add one or more intensive sweeteners such as aspartame, acesulfame and salts and derivatives thereof, saccharine, neohesperidin dihydrochalcone, sucralose, etc., aromatic active ingredients or flavourings in powder form or carried by encapsulation, etc., food acids, or other additives with specific functions, and pharmaceutical active ingredients or nutritional active ingredients such as vitamins, amino-acids, polypeptides, or other substances with functional or cosmetic activity.

Naturally, the addition of flavourings, encapsulated or otherwise carried, and the addition of heat-sensitive active ingredients takes place after the grinding in the stabilization step carried out with the use of one or more anti-agglutination agents known in the art and commonly used for this purpose, such as, for example, magnesium stearate, silica, talc, polyols of the type

most suitable for compression, for example, isomalt, xylitol, etc.

After being formed into tablets or pills, the chewing gum thus obtained can thus also be sugar-coated as a normal chewing-gum or confectionery product, including intensive sweeteners, flavourings and active ingredients as described above in the coating.

COMPARATIVE SECTION

Despite constant attempts to apply instrument-based assessment methods to the study of chewing gum and the identification of its properties, the determining factor in the assessment of the chewing properties of a chewing gum is still subjective assessment by the chewer. The typical chewing sensation in fact includes the perception, prolonged over time, of odour, flavour, taste, colour, consistency, palatability and aftertaste.

Although qualitative and quantitative analytical methods exist for establishing the residual content of flavouring, active ingredients, and sweeteners or sugar in a chewing gum at a specific moment during chewing, there is not yet a method of assessing the perception of the pleasantness of the release of the flavouring and of the sweetness or the duration of both.

There are also objective parameters which may enable individual properties of the chewing gum to be assessed but, at the moment, there is no technique which is sufficiently sophisticated and complete to assess the combination of chewing properties defined as a whole in English as "mouth feel", which consists of a perception of various factors such as softness, resilience, slipperiness, and consistency of the bolus, which constitute the palatability of a chewing gum.

In order to assess the innovative aspects of the present invention, sensory assessment by a panel of chewers was therefore used and, in parallel, at least one significant parameter was assessed by performing a test measurement by means of a penetrometer.

The sensory assessment of the performance of a chewing gum and of the basic gum used to prepare it is generally based on three consecutive stages, referred to as (a) the first biting or chewing stage, (b) the intermediate biting or chewing stage, and (c) the final biting or chewing stage. To look at the assessment of a gum in greater detail, the first stage (a) or "first bite" corresponds to the first seconds of chewing in which the chewing gum is placed in the mouth and bitten into. At this stage, the chewing gum should respond to quite precise requirements such as the correct degree of compliance under the teeth, and should avoid breaking up into minute parts which might even involuntarily be ingested, which typically occurs with commercially-available compressed chewing gums. At the same time, however, in order for chewing to be pleasant from the very first moments, the chewing gum should not be particularly hard or stiff, which is another property that is lacking in currently available products of this type.

The second stage (b), known as the "intermediate" stage, is of longer duration and corresponds to the period of 30-60 seconds during which most of the sugar or sweeteners go into solution owing to the effect of the saliva and the product simultaneously releases most of the flavour. In this stage, it is particularly important for chewing to be uniform, in other words, for the physical drop in consistency due to the

dissolving to be slight and not too noticeable, thus maintaining so-called "linear" behaviour.

The third or "final" stage (c) starts about one minute after the start of chewing and continues throughout the remaining time for which the gum is chewed. After most of the sugar or sweeteners have dissolved, a flavouring portion and a residue of sugars are still present and the gum is partially hydrated. During this stage, the characteristics of the basic gum are fundamental since it represents almost the whole of the residual bolus. With gums of a particular firmness which are used because they are more easily broken up, even if the intrinsic hardness is not perceived in the first two stages, possibly by virtue of some expedients, it will inevitably become apparent at this stage, rendering chewing difficult and unpleasant and, as such, not at all appealing.

Amongst the various parameters indicative of the performance of a chewing gum which can be measured objectively, that which relates to the chewing stage (a) or "first bite" is certainly indicative, though not exhaustively, of the quality of the product. The force necessary for a tooth initially to penetrate a sugar-coated pill or a tablet is in fact proportional to the hardness of the pill or tablet and can therefore give a measurement of how pleasant chewing may be. For tablets, hardness is proportional to friability and to the tendency to crumble during the first bites. The harder the product is, and hence the easier it is to grind and compress, the more marked will be its tendency to break up into minute bits which might even be ingested involuntarily. To demonstrate this, some measurements have been made on commercially-available products, experimental test pieces, and samples

available commercially at trade fairs, with the use of a penetrometer (Sommer & Runge KG, Berlin) which is commonly used in the industry for assessing the hardness of plastic materials such as waxes which, as is well known, are also ingredients used in the preparation of the basic gum.

The measurements made, which were performed in parallel with sensory assessments, gave results indicative of the superior chewing characteristics of the samples produced in accordance with the present invention. Table 4 gives the results obtained for two commercial products, indicated as brand A and brand B, respectively, a product distributed at a trade fair, indicated as brand C, and two samples produced in accordance with the present invention.

Table 4

	Sensory assessment upon: "first bite"	Penetration index (values in 1/10 mm)
Brand A*	Hard and friable in the mouth	1 - 3
Brand B*	Hard and friable in the mouth	3 - 3.5
Brand C*	Very hard and markedly friable in the mouth	1.5 - 3
Example 6	Soft. Not friable	6 - 7.5
Example 8	Quite soft. Not friable	6 - 7.5

*: The products indicated as BRAND A, B and C are compressed powder chewing gums corresponding respectively to:

BRAND A: Golnatur Propol-young, "Gum Tech"®, lemon taste marketed by D. ULRICH SpA, Torino.

BRAND B: "Vitermine vitamine erbe e minerali Gola", mint taste, marketed by GUABER, Funo, Italia.

BRAND C: Compressed chewing gum tablets made with Satin® I gum base manufactured by L.A. Dreyfus Company.

As can be seen, the experimental measurement confirms the judgement with regard to the sensory assessment of the specific parameter.

The performance claimed in the present invention is achieved with the use of "soft" gums which give rise to products with a pleasant chewing profile which is comparable with, if not better than, that of conventional products.

It is important to stress that the values given above are significant only to the above examples and variations in the composition of the basic gum may lead to appreciably different results. Although basic gums having formulations other than that given above are used conventionally for the preparation of high-quality chewing-gum products by conventional methods in conventional formats, i.e., sticks, or dragées, they do

not have the characteristics of softness possessed by basic gums with the formulation given above.

In particular, it can easily be shown that high-quality basic gums in which only two of the categories of ingredients indicated above differ from those of the gums of the present invention have clearly different characteristics in terms of softness. Two basic gums, identified as gum 1 and gum 2, given by way of example in Table 5, have the following differences in comparison with the formulation described above.

Table 5

	gum 1	gum 2	gum 3
waxes selected from the group comprising vegetable waxes and waxes derived from petroleum or produced by synthesis	30 - 32 %	30 - 32 %	0 - 7 %
inert mineral filler products	10 - 12 %	10 - 12 %	15 - 40 %

To confirm what has been stated and the difference described, a test measurement by penetrometer was also used in this case to assess the consistency and hardness of the basic gum samples, by comparing the two samples described above with a third identified as: gum 3 which had a formulation corresponding to that described above. The results are given in Table 6.

Table 6

	gum 1	gum 2	gum 3
Penetration in 1/10 mm (values of three readings)	8 / 9.5 / 9.5	10.5 / 9.5 / 9.5	21 / 21.5 / 22
Penetration in 1/10 mm (calculated average of three readings)	9	9.8	21.5

A further parameter commonly used by the industry to characterize a basic gum is the softening point. This measurement, which is performed by the so-called "ring & ball" technique, provides for the measurement of the initial softening temperature of the basic gum and the temperature at which it actually passes through, with the use of a standard body, once the softening point is reached. Two temperatures and the respective interval are thus obtained and provide extremely useful information on the characteristics of the gum. In the specific case of the gums given by way of example, the temperatures measured are given in Table 7.

Table 7

	gum 1	gum 2	gum 3
Initial softening temperature (°C)	77	78	47
Softening Point (°C)	79	79	56
Softening interval (°C)	2	1	9

It is clear from the data set out above that the difference between the examples, gum 1 and gum 2, on the one hand and gum 3, on the other, is not only in the macroscopic difference in the absolute values of the softening temperatures which would themselves be a significant indicator; in fact, the extent of the softening interval is also in direct correlation with the characteristics of greater plasticity and softness in gum 3 in comparison with the greater stiffness of gum 1 and gum 2.

It is thus clear that the use of a soft basic gum is a particularly important parameter for the production of chewing gums in powder form which have palatability characteristics comparable with, if not better than, those of conventional chewing gums.

CLAIMS

1. Method of producing chewing gum in powder form, constituted substantially by the following steps:

a) mixing of a soft basic gum with at least one sweetener and, optionally, at least one other typical chewing-gum ingredient, at a temperature of between about 35 and 75°C

b) cooling of the mixture thus obtained to a temperature of between about 0 and -40°C,

c) grinding and subsequent screening of the mixture thus obtained to give a powder having a particle size less than about 10 mesh,

d) optional mixing of the powder thus obtained with at least one anti-agglutination agent,

e) optional mixing of the powder thus obtained with one or more of sweeteners, flavourings, colourings, food acids, or other additives,

f) optional compression of the mixture thus obtained.

2. Method according to Claim 1, characterized in that the cooling is performed to a temperature of between about -10 and -40°C.

3. Method according to Claim 1, characterized in that step c) is performed to give a powder having a particle size of less than about 14 mesh.

4. Method according to Claim 1, characterized in that the soft basic gum is characterized by a penetration index, in 1/10 mm, which is greater than about 15 and, preferably, greater than 18.

5. Method according to Claim 1, characterized in that the soft basic gum has the following composition by weight: from about 8 to 16 % of at least one elastomer, from about 12 to 19% of polyvinyl acetate, from about 14 to 30% of resin, from about 10 to 22% of at least one hydrogenated and/or partially hydrogenated

vegetable oil, from about 0 to 7% of wax, from about 5 to 9% of at least one emulsifier and/or a technological assistant, from about 15 to 40% of inert mineral fillers, and up to about 0.1% of antioxidant, in which the sum of the various components amounts to 100.

6. Method according to Claim 5, characterized in that the elastomer is selected from polyisobutylene, isobutylene/isoprene copolymer, and vinyl acetate/vinyl laurate copolymer.

7. Method according to Claim 5, characterized in that the resin is selected from vegetable resin esters, resins produced by synthesis, and/or terpene resins.

8. Method according to Claim 5, characterized in that the wax is selected from vegetable waxes, waxes derived from petroleum, and/or synthetic waxes.

9. Method according to Claim 5, characterized in that the emulsifier is selected from glycerol monostearate, sugar esters, and lecithin, and the technological assistant is selected from acetylated monoglycerides and triacetin.

10. Method according to Claim 1, characterized in that, if the sweetener and the other ingredient of step a) are used in the solid state, they have a particle size of less than about 200 μm .

11. Method according to Claim 1, characterized in that the sweetener of step a) is selected from sucrose or glucose syrup, or one or more polyols such as, for example sorbitol, mannitol, lactitol, isomalt, xylitol, or syrups thereof.

12. Method according to Claim 1, characterized in that the typical chewing-gum ingredient is selected from: intensive sweeteners, flavourings, one or more additives, colourings, or mixtures thereof.

13. Method according to Claim 12, characterized in that the intensive sweetener is selected from : aspartame, acesulfame and salts and derivatives thereof, saccharine, neohesperidin dihydrochalcone, sucralose, neotame, thaumatococine and monelline or mixtures thereof.

14. Method according to Claim 1, characterized in that the anti-agglutination agent is selected from magnesium stearate, silica, talc, sugar esters and/or polyols.

15. Method according to Claim 1, characterized in that it is performed in the absence of granulation coadjuvants such as alkali-metal phosphates, alkaline-earth metal phosphates, maltodextrins or mixtures thereof, and/or in the absence of bulking agents such as, for example, gum arabic or pectin.

16. Method according to any one of Claims 1-15, characterized in that the powder obtained in step (d) is mixed with at least one pharmaceutical, cosmetic and/or nutritional active ingredient and/or with at least one of sweeteners, flavourings, colourings, and other additives, prior to being subjected to the compression step.

17. Chewing gum in powder form obtainable by the method according to any one of Claims 1-16.

18. Compressed chewing gum obtainable by the method according to any one of Claims 1-17.

19. Chewing gum in powder form characterized by containing, as a starting material, a soft basic gum having a penetration index, in 1/10 mm, which is greater than about 15.

20. Chewing gum in powder form characterized by containing, as a starting material, a soft basic gum having a penetration index, in 1/10 mm, which is greater than about 18.

21. Chewing gum in powder form according to claims 19 and 20 characterized by being in compressed form.

22. Compressed chewing gum according to claims 18 or 21 characterized by containing from about 60 to 90% of the total weight of basic gum and from about 5 to 25% of the total weight of bulk sweeteners.

23. Compressed chewing gum according to claim 22 characterized by containing from about 60 to 90% of the total weight of basic gum and from about 10 to 20% of the total weight of bulk sweeteners.

24. Compressed chewing gum according to claims 18-23 characterized by having a weight lower than about 1.2 grams, preferably lower than 0.8 grams, even more preferably less than 0.5 grams.

25. Compressed chewing gum according to claims 18-24 characterized by having a diameter lower than about 10 mm, preferably lower than 8 mm.

26. A coated chewing gum product comprising a gum center and a coating, characterized in that the gum center is a compressed chewing gum according to claims 18-25.

27. A coated chewing gum product according to claim 26, characterized in that the coating comprises up to about 55 by weight of the coated chewing gum.

28. A coated chewing gum product according to claim 27, characterized in that the coating comprises up to about 45% by weight of the coated chewing gum.

29. A coated chewing gum product according to claims 26- 28, characterized in that more than about 80% by weight of the coating consists of bulk sweeteners, preferably from 85 to 95%.

INTERNATIONAL SEARCH REPORT

International Application No

PCT/EP 03/03598

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 A23G3/30 A61K9/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 A23G

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, PAJ, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4 000 321 A (MOCHIZUKI KEIZO ET AL) 28 December 1976 (1976-12-28) cited in the application	1-4, 10-12, 15-25 26-29
Y	column 4, line 24 - line 40 column 3, line 42 - column 4, line 20 column 7, line 40 - line 44 column 2, line 53 - column 3, line 19; example 1 column 4, line 5 - line 10 ----- -/--	



Further documents are listed in the continuation of box C.



Patent family members are listed in annex.

* Special categories of cited documents :

A document defining the general state of the art which is not considered to be of particular relevance

E earlier document but published on or after the international filing date

L document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

O document referring to an oral disclosure, use, exhibition or other means

P document published prior to the international filing date but later than the priority date claimed

T later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

X document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

Y document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

& document member of the same patent family

Date of the actual completion of the international search

15 July 2003

Date of mailing of the international search report

24/07/2003

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Guyon, R

INTERNATIONAL SEARCH REPORT

International Application No

PCT/EP 03/03598

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y	US 2 290 120 A (THOMAS CHRISTOPHER F) 14 July 1942 (1942-07-14) cited in the application page 1, column 1, line 55 -page 1, column 2, line 5 page 2, column 1, line 9 - line 25 page 2, column 1, line 43 -column 2, line 13; claims 1-8 page 2, column 2, line 18 - line 36	1-3, 5-12, 15-18 26-28
X Y	DE 28 08 160 A (NORDSTROEM RABBE) 30 August 1979 (1979-08-30) page 5, paragraphs 1-3 page 3, paragraphs 1,2 page 4, paragraph 1 page 4, paragraph 3	1-3, 10-12, 17,18, 26-29 4-9, 11-15, 20-25
X Y	US 4 753 805 A (BIKKINA KIRSHNAYYA ET AL) 28 June 1988 (1988-06-28) column 6, line 14 - line 42; examples column 7, line 22 - line 44	19 4-9, 11-15, 20-25
X Y	US 6 322 828 B1 (ATHANIKAR NARAYAN K ET AL) 27 November 2001 (2001-11-27) column 3, line 65 -column 4, line 60; claims 1-5,8,9,15,16,24,32 column 6, line 32 -column 7, line 17 column 7, line 40 - line 55 & WO 01 19206 A (N.K.ATHANIKAR ET AL.) 22 March 2001 (2001-03-22) cited in the application	1-3,5,6, 10-20 26-29
X Y	WO 99 26485 A (MEYERS MARC A ;WHISTLER ROY L (US); YATKA ROBERT J (US); BARKALOW) 3 June 1999 (1999-06-03) examples; tables	19,20 26-29
X Y	US 4 405 647 A (FISHER E EUGENE ET AL) 20 September 1983 (1983-09-20) claims; figures 10,11,5,1,2	1,3, 10-12, 14,17,18 26-29

-/--

INTERNATIONAL SEARCH REPORT

International Application No

PCT/EP 03/03598

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 99 17618 A (WOLF FRED R ;TYRPIN HENRY T (US); WHISTLER ROY L (US); YATKA ROBER) 15 April 1999 (1999-04-15) the whole document	19,20, 26-29
X	PATENT ABSTRACTS OF JAPAN vol. 008, no. 067 (C-216), 29 March 1984 (1984-03-29) & JP 58 220655 A (LOTTE KK), 22 December 1983 (1983-12-22)	1-3,10, 17,18
Y	abstract	4-8
X	US 4 698 223 A (SOZZI GIUSEPPE ET AL) 6 October 1987 (1987-10-06)	19,20
Y	claims 1-3,8-10; examples	4-8
X	US 4 948 595 A (PATEL MANSUKH M ET AL) 14 August 1990 (1990-08-14) claim 9; example X	19,20
X,P	WO 02 051258 A (ATP AVANT GARDE TECHNOLOGIES P ;BADETTI ROLANDO (IT)) 4 July 2002 (2002-07-04) example 1	1,16
X	US 4 588 592 A (ELIAS RONALD J) 13 May 1986 (1986-05-13) cited in the application claims 1-5,15,23,24,26,28	1-3, 10-12, 17,18
X	US 4 161 544 A (KAUL DIETER) 17 July 1979 (1979-07-17) cited in the application claims; example 1	1,11,12, 17,18
X	EP 0 427 505 A (WARNER LAMBERT CO) 15 May 1991 (1991-05-15) the whole document	19,20

INTERNATIONAL SEARCH REPORT

International Application No

PCT/EP 03/03598

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 4000321	A	28-12-1976	JP 1145755 C JP 50145560 A JP 57016773 B CH 604480 A5 DE 2521776 A1 DE 2560100 B1 FR 2270800 A1 GB 1456474 A	12-05-1983 21-11-1975 07-04-1982 15-09-1978 20-11-1975 02-10-1980 12-12-1975 24-11-1976
US 2290120	A	14-07-1942	NONE	
DE 2808160	A	30-08-1979	DE 2808160 A1	30-08-1979
US 4753805	A	28-06-1988	AU 3668684 A CA 1240875 A1 EP 0151344 A2 ES 8608288 A1 JP 60164438 A ZA 8409689 A	08-08-1985 23-08-1988 14-08-1985 01-12-1986 27-08-1985 31-07-1985
US 6322828	B1	27-11-2001	AU 5318100 A CA 2381580 A1 EP 1211951 A1 WO 0119206 A1 US 2003099741 A1	17-04-2001 22-03-2001 12-06-2002 22-03-2001 29-05-2003
WO 9926485	A	03-06-1999	WO 9926485 A1 AU 5266798 A BR 9714962 A CA 2310503 A1 EP 1032276 A1	03-06-1999 15-06-1999 03-10-2000 03-06-1999 06-09-2000
US 4405647	A	20-09-1983	NONE	
WO 9917618	A	15-04-1999	WO 9917618 A1 AU 4899797 A	15-04-1999 27-04-1999
JP 58220655	A	22-12-1983	JP 1041301 B JP 1555908 C	05-09-1989 23-04-1990
US 4698223	A	06-10-1987	IT 1180176 B BE 902529 A1 CA 1245505 A1 CH 664282 A5 DE 3439658 A1 DK 514984 A ,B, EG 17212 A ES 8600606 A1 FI 850976 A ,B, FR 2565070 A1 GB 2159384 A ,B GR 81041 A1 HK 26088 A IE 55625 B1 IL 75338 A IN 160941 A1 JP 1595417 C JP 2018049 B	23-09-1987 29-11-1985 29-11-1988 29-02-1988 05-12-1985 30-11-1985 30-12-1989 16-01-1986 30-11-1985 06-12-1985 04-12-1985 27-03-1985 15-04-1988 21-11-1990 15-11-1988 15-08-1987 27-12-1990 24-04-1990

INTERNATIONAL SEARCH REPORT

International Application No

PCT/EP 03/03598

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 4698223	A	JP 60251847 A	12-12-1985
		NL 8403376 A ,B,	16-12-1985
		NO 852084 A ,B,	02-12-1985
		OA 8024 A	31-01-1987
		PH 23639 A	27-09-1989
		PT 80548 A ,B	01-06-1985
		SE 462260 B	28-05-1990
		SE 8405289 A	30-11-1985
		ZA 8504002 A	26-03-1986
US 4948595	A 14-08-1990	AT 93125 T	15-09-1993
		AU 621770 B2	19-03-1992
		AU 6075590 A	17-01-1991
		CA 1328372 C	12-04-1994
		CN 1048966 A	06-02-1991
		DE 69002818 D1	23-09-1993
		DE 69002818 T2	09-12-1993
		DE 431148 T1	28-11-1991
		EP 0431148 A1	12-06-1991
		JP 4500757 T	13-02-1992
		NO 910798 A	27-02-1991
		NZ 234146 A	28-07-1992
		PH 26726 A	28-09-1992
		WO 9100020 A1	10-01-1991
WO 02051258	A 04-07-2002	IT MI20002810 A1	24-06-2002
		WO 02051258 A2	04-07-2002
US 4588592	A 13-05-1986	NONE	
US 4161544	A 17-07-1979	DE 2710579 A1	14-09-1978
		FR 2382863 A1	06-10-1978
		IT 1107604 B	25-11-1985
EP 0427505	A 15-05-1991	US 5030459 A	09-07-1991
		AU 6577890 A	16-05-1991
		CA 2029362 A1	08-05-1991
		CN 1051484 A	22-05-1991
		DE 69011813 D1	29-09-1994
		DE 69011813 T2	15-12-1994
		DK 427505 T3	02-01-1995
		EP 0427505 A2	15-05-1991
		ES 2057440 T3	16-10-1994
		JP 3026835 B2	27-03-2000
		JP 3172142 A	25-07-1991
		MX 166492 B	12-01-1993
		NO 904823 A	08-05-1991
		PH 27196 A	16-04-1993
		PT 95794 A	13-09-1991
		ZA 9008891 A	28-08-1991